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INDEX

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STATEMENT OF PURPOSE

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This publication is printed primarily to inform professional range administrators of important range improvement and management developments and findings. These "Notes" may include extracts of published papers, unpublished preliminary reports of research work, unpublished reports on administrative studies, and personal observations or suggestions of other range administrators. No claim is made as to the accuracy or completeness of studies or conclusions drawn.

All who read these **RANGE IMPROVEMENT NOTES** are encouraged to submit material for publication, or suggestions for improving its usefulness. Full credit will be given for any material used.

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BRUSH REMOVAL BY CHAIN DRAG

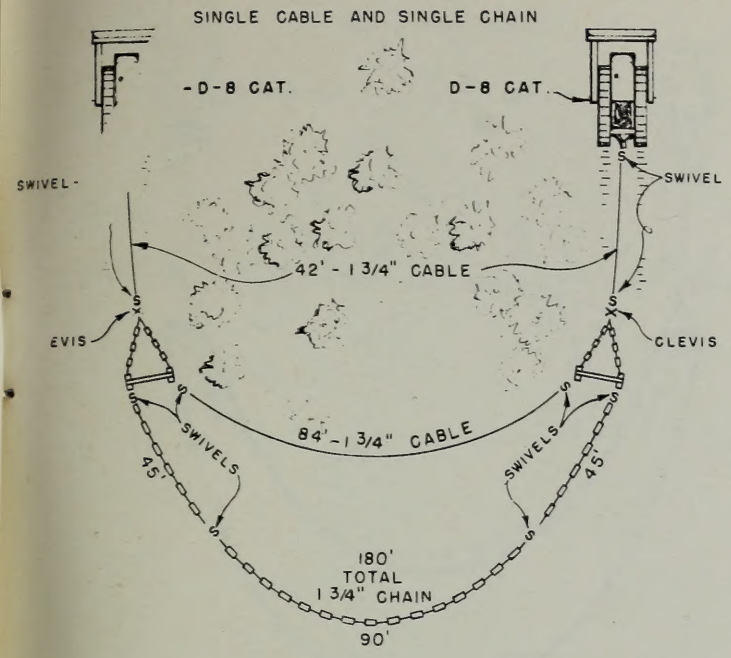
Condensed From
Project Report on TEB - 602
Bureau of Indian Affairs

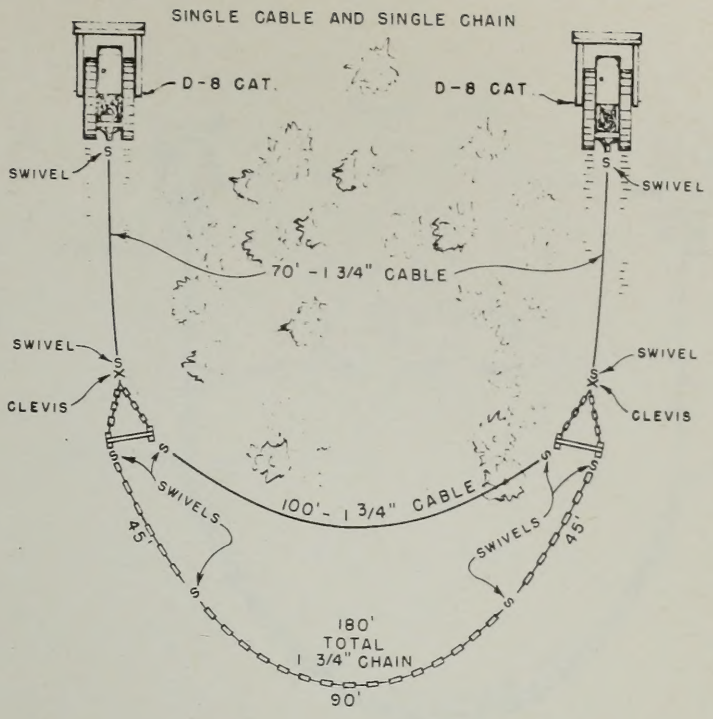
- - - -

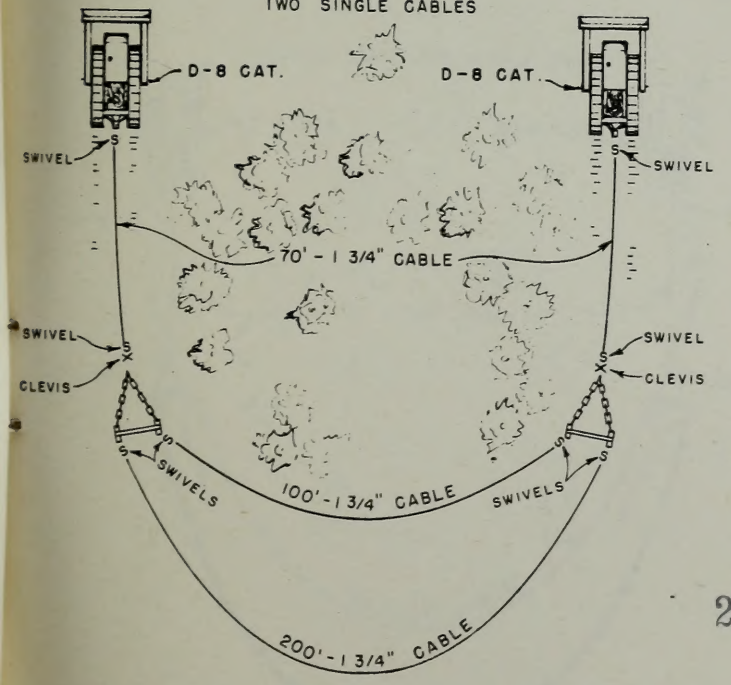
A project was assigned the Bureau of Indian Affairs by the Range Reseeding Equipment Committee to develop and field test different combinations of double loop drags for eradication of juniper. It was hoped a drag could be developed which would eradicate all age classes of juniper without dragging the second time in opposite direction.

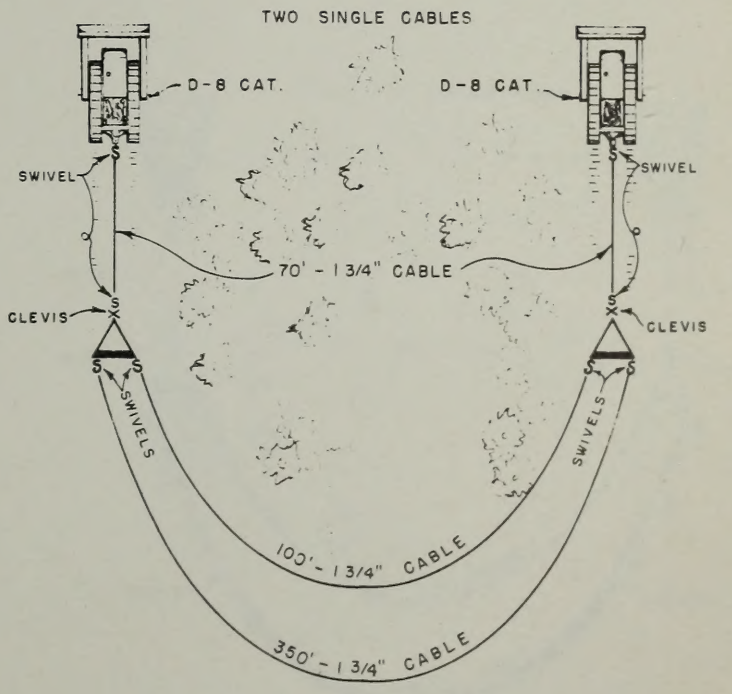
The tests were conducted May 27 and 28, 1957, on the Fort Apache Reservation, Whiteriver, Arizona. The site selected was a gently sloping area where fairly consistent tractor speeds could be maintained. It had an average tree density of 200 stems per acre ranging from 80 to 400 stems. Utah juniper dominated with occasional alligator juniper and pinon pine. The stems varied in diameter at ground level from 1 inch to 14 inches for an average of 8 inches. Moisture conditions were below optimum for this work. The designated strips were 1,900 feet long and 75 feet wide. The soil was a fine sandy loam over a clay subsoil. Slope, density, composition, and soil moisture were uniform.

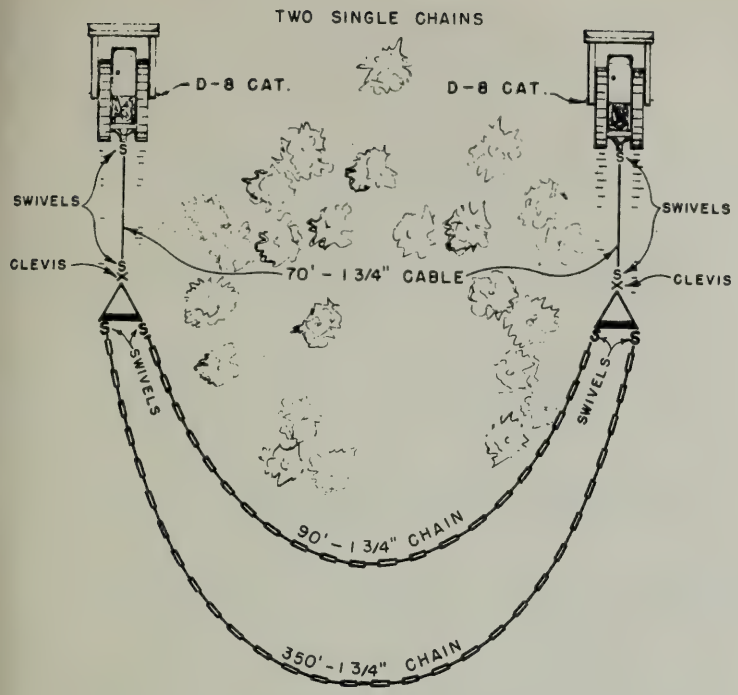
Single loops made up of both 1-3/4 inch anchor chain and cable were used for a comparison with the double loop combinations. The double loop combinations tested are illustrated on the following pages.

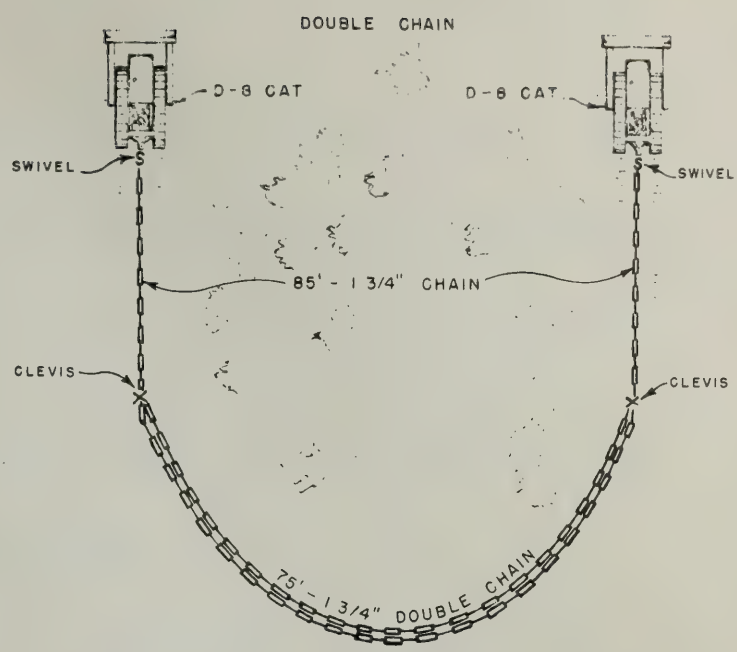

SINGLE CABLE AND SINGLE CHAIN
D-8 CAT.
D-8 CAT.
SWIVEL
SWIVEL
42' - 1 3/4" CABLE
EVIS
CLEVIS
84' - 1 3/4" CABLE
SWIVELS
SWIVELS
45'
45'
180'
TOTAL
1 3/4" CHAIN
90'

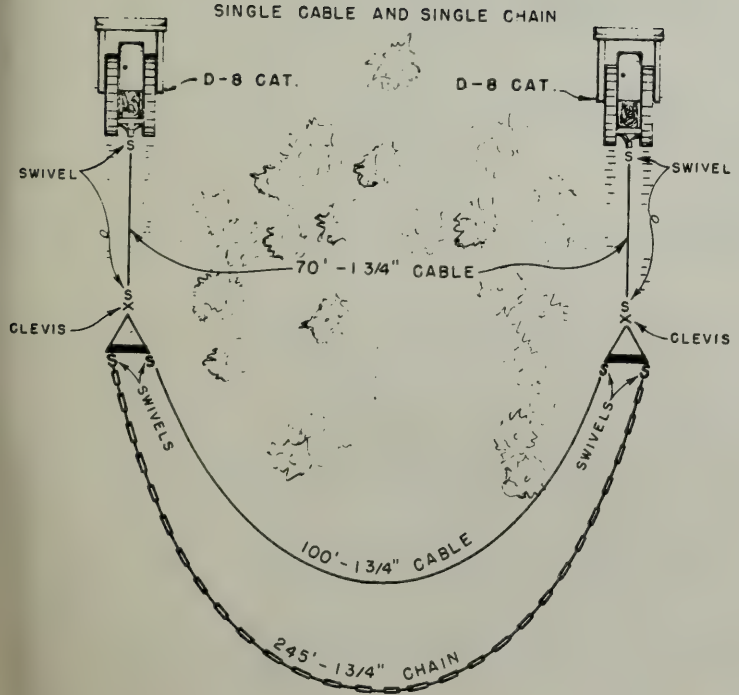

SINGLE CABLE AND SINGLE CHAIN
D-8 CAT.
D-8 CAT
SWIVEL
SWIVEL
70' - 1 3/4" CABLE
SWIVEL
SWIVEL
CLEVIS
CLEVIS
100' - 1 3/4" CABLE
SWIVELS
SWIVELS
45'
45'
180'
TOTAL
1 3/4" CHAIN
90'

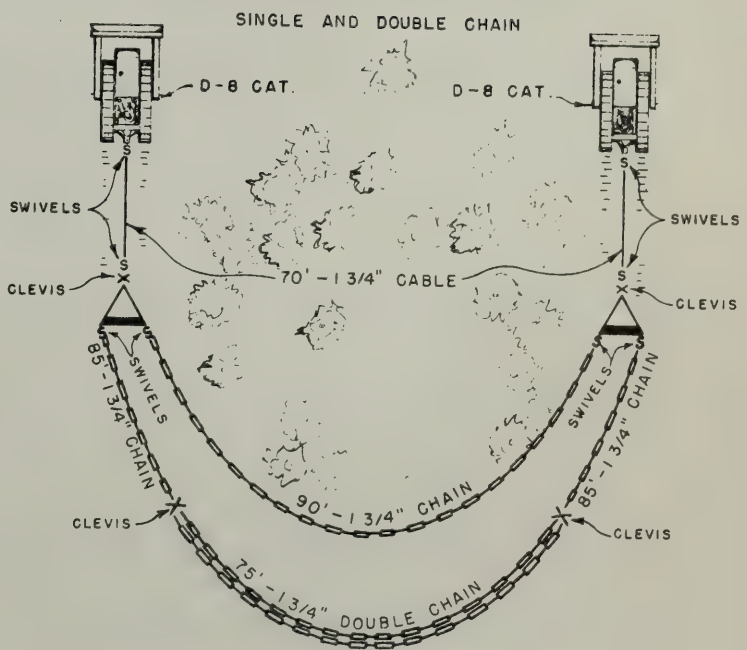

TWO SINGLE CABLES
D-8 CAT.
D-8 CAT.
SWIVEL
SWIVEL
70' - 1 3/4" CABLE
SWIVEL
SWIVEL
CLEVIS
CLEVIS
SWIVELS
SWIVELS
100' - 1 3/4" CABLE
200' - 1 3/4" CABLE


TWO SINGLE CABLES
D-8 CAT.
D-8 CAT.
SWIVEL
SWIVEL
70' - 1 3/4" CABLE
CLEVIS
CLEVIS
SWIVELS
SWIVELS
100' - 1 3/4" CABLE
350' - 1 3/4" CABLE


TWO SINGLE CHAINS
D-8 CAT.
D-8 CAT.
SWIVELS
SWIVELS
CLEVIS
CLEVIS
70' - 1 3/4" CABLE
SWIVELS
SWIVELS
90' - 1 3/4" CHAIN
350' - 1 3/4" CHAIN


DOUBLE CHAIN
D-8 CAT
D-8 CAT
SWIVEL
SWIVEL
85' - 1 3/4" CHAIN
CLEVIS
CLEVIS
75' - 1 3/4" DOUBLE CHAIN


SINGLE CABLE AND SINGLE CHAIN
D-8 CAT.
D-8 CAT.
SWIVEL
SWIVEL
70' - 1 3/4" CABLE
CLEVIS
CLEVIS
SWIVELS
SWIVELS
100' - 1 3/4" CABLE
245' - 1 3/4" CHAIN


SINGLE AND DOUBLE CHAIN
D-8 CAT.
D-8 CAT.
SWIVELS
SWIVELS
70' - 1 3/4" CABLE
CLEVIS
CLEVIS
85' - 1 3/4" CHAIN
SWIVELS
SWIVELS
85' - 1 3/4" CHAIN
90' - 1 3/4" CHAIN
CLEVIS
CLEVIS
75' - 1 3/4" DOUBLE CHAIN

The single loop combinations were pulled in second and third gears at speeds of 2.3 and 2.8 miles per hour respectively. In all phases of the double loop testing the tractors were operated in first gear at a speed of 1.7 miles per hour. All double loop combinations accumulated an excessive amount of trash on the back loop. The accumulations of trash on the back loop in all combinations very definitely lessened the effectiveness of the front loop. The tension of the front loop was lost, the snap which is so effective in the single cable drag was almost completely gone.

The specific disadvantages of the double loop drag, which are listed below, were the observations and unanimous opinion of B.I.A. technicians assigned to take part in the project.

1. Piling of the second loop necessitated the tractor's whip-sawing or stopping the operations to disconnect one of the tractors to free the chain or cable by use of the bulldozer.

2. It was more expensive to operate the tractors in first gear and it took at least twice as long to clear the strips in comparison to the length of time similar strips were cleared with the single loop. During the single loop operations the tractors operated in second and third gear.

3. The continuous maximum power exerted by both D-8 tractors could result in expensive mechanical failures. It was noted that an excessive amount of master clutching was required.

4. The tremendous weight of trees on the second loop excessively destroyed sod and seriously damaged the surface of the area over which it passed.

5. The second loop tended to roll up on the pile of trash causing it to ride high and lose much of its effectiveness.

6. Young whip-size reproduction was not removed by any double loop drag tested. The adjustments for the eleven strip tests were all made at one location. The tractors dragged eleven times over one area in making the swing for the next strip. Within the area were some whip-size juniper. Since each hook-up had an average of two chains, or cables, or combinations thereof, these juniper were dragged twenty times. Not one juniper was removed. The extent of the damage was to bend the whip and debark it a little on one side.

From these observations the B. I. A. technicians concluded that any combination of double loop drag developed at this field test was not economically practical and until further conclusive evidence proves differently, they do not recommend the use of double loop chain drags in the eradication of juniper. It is their opinion that it is more effective to use a single loop drag passing over the stems in the opposite direction than to use a double loop drag in one direction.

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ESSAY ON PRIDE

The peacock of today may be the feather duster of tomorrow.

A SIMPLE METHOD FOR CALIBRATING GROUND SPRAY RIG

DuPont Agricultural News Letter
May - June, 1956

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The importance of applying just the right amount of spray per acre cannot be overemphasized. The success or failure of your control program may depend on it.

Proper calibration of a sprayer to apply specified amounts can be a confusing and time-consuming job unless a simple set of rules are followed. The instructions given below came from a recent bulletin from the University of Massachusetts and are one of the most explicit sets of directions yet seen for this operation:

"To be certain of applying the correct amount of herbicide, you must know the volume of spray delivered per acre. This may be checked by a test-run over some measured distance.

"1. Set marker at some measured distance - the greater the distance the more accurate the calibration.

"2. Fill the tank with water and have pump in motion back of the starting line, with boom valve closed.

"3. Open valve as starting line is crossed and drive at rate to be used in spraying operation, with throttle in marked position.

"4. Shut valve as finish line is passed.

"5. Measure exact amount of water needed to refill the tank.

"6. To figure acre rate of discharge use the following formula:

$$\frac{43,560 \times \text{Gallons Used}}{\text{Distance (ft.)} \times \text{Effective Swath Width}} = \text{Gallons per Acre.}"$$

Example: Assuming 14 gallons used, 660 ft. distance traveled, and 20 feet swath width, we have $\frac{43,560 \times 14}{660 \times 20} = 46.2$ Gallons Per Acre.

You then decide either (1) to apply the recommended amount of herbicide to each 46 gallons of water or (2) a new gallonage rate by altering the speed, pressure, or nozzle opening.

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TWO METHODS CLEAN 2,4-D FROM SPRAYERS

Stauffer Chemical Company News Letter
February 1956

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How to clean 2,4-D from spray equipment? There are only two formulas that can be followed, and they should be followed very closely before using spraying equipment for other purposes on susceptible plants.

The first thing that should be done is to flush the equipment with plenty of water. Then, fill the tank with water and add two pounds of soda ash per 100 gallons.

Soda ash is approximately a 50-50 mixture of lye and sal soda. Wash the inside of the tank thoroughly with this solution, running some through the pump tank and making sure that the solution goes through all the system and that all lines are washed out, and then leaving some in the tank from 8 to 12 hours. After that, rinse out thoroughly with more fresh water.

Another method that can be used calls for use of activated charcoal, which is available commercially and is much faster but also more expensive. 2,4-D usually can be removed by rinsing the sprayer for about two minutes with a one percent solution of activated charcoal, followed by a rinse of clean water.

To make sure that all of the 2,4-D is out of the sprayer, fill it with clean water and spray a few seedlings of very sensitive plants, such

as beans or tomatoes. If the plants are not affected within one or two days, the equipment is more than likely safe for further use.

For small spray equipment such as a three-gallon spray, where the cost factor is not so important, household ammonia, if handy to use, is satisfactory. Rinse the equipment well with water after spraying with 2,4-D then fill the spray equipment with the ammonia solution, using one-half cup household ammonia to three gallons of water. Let the equipment soak for 18 to 24 hours.

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TEN SAFETY RULES

Go less, sleep more.

Ride less, walk more.

Talk less, think more.

Scold less, praise more.

Waste less, give more.

Eat less, chew more.

Clothe less, bathe more.

Worry less, laugh more.

Idle less, play more.

Preach less, pray more.

PHILOSOPHY OF RANGE MANAGEMENT

By
Albert Albertson*
Forest Supervisor of Dixie National Forest

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Operation of livestock on the range is an operation by man that must conform to the laws of nature if he or his posterity are to survive. Nature is most uncompromising, and although her laws grind slowly they grind exceedingly fine. Man is given the intelligence to abide by these laws and survive or he may violate them and perish, whichever he chooses. Regardless of what he does in committee meetings, convention assemblies, or halls of legislation, Nature takes her course. If men make mistakes they had better make them on the side of cooperating with Nature, rather than on the side of trying to defy her.

* Retired.

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HINDU PROVERB

There is nothing noble in being superior to some other man. The true nobility is in being superior to your previous self.

SAGEBRUSH CONTROL IN OREGON[1]

D. N. Hyder and F. S. Sneva[2]

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Range personnel are looking to chemical sagebrush control with keen interest because it appears to be relatively free of investment risk, relatively cheap with costs ranging from about $2.25 to $3.50 per acre, and easily and quickly accomplished by aerial spraying. Perhaps the ease and speed of aerial spraying has induced some neglect for the importance of site selection and management planning. Such neglect offers nothing more than future anguish.

We shall summarize some of the differences in spraying requirements. In listing spraying requirements we do not imply a cut-and-dried thing. The area of choice and substitution is important in adapting the requirements to local conditions.

Big sagebrush in pure stands on level or slightly rolling topography, with a fair to good understory of grasses, is the most favorable type for spraying. Clumps of grass should be frequent enough to permit one to step from clump to clump without too many misses. There should be a fair abundance of those species which respond most rapidly. Here we may spray with an ester 2,4-D at 1-1/2 pounds per acre in five gallons of water and obtain excellent kills when the sagebrush is growing rapidly. Big sagebrush is susceptible from the time new leaves are full-sized, or from the time Sandberg bluegrass is headed until this grass is losing green color rapidly.

Seeded range which has been invaded by sagebrush and rabbitbrush is another favorable area for spraying.

Rabbitbrush (principally Chrysothamnus viscidiflorus) is quite commonly found in association with big sagebrush. Experimental trials have shown that both species may be killed with a single application of an ester 2, 4-D. Sagebrush susceptibility, however, develops much earlier in the season than does the susceptibility of rabbitbrush. If we spray too early we can obtain selective sagebrush control and leave the rabbitbrush to wreck havoc in the future.

We also note that as growth activity diminished in late June and early July, the mortality of sagebrush decreased more quickly than did rabbitbrush mortality. (See Figure 1.) In drought years rabbitbrush does not develop sufficient susceptibility to permit satisfactory kills because soil moisture is depleted too early. Thus, for the simultaneous control of big sagebrush and green rabbitbrush (or for rabbitbrush alone) we recommend the application of an ester 2, 4-D at three pounds per acre in water (with emulsifier) at five gallons per acre. This must be applied after rabbitbrush twig growth exceeds three inches in length, when Sandberg bluegrass is flowering and forming seed, and when other bunchgrasses such as Sitanion hystrix, Koeleria cristata, Stipa thurberiana, and Agropyron spicatum have headed out. Spraying should be terminated when Sandberg bluegrass is losing green color rapidly, or when soil moisture reaches the wilting point at a depth of six to eight inches.

Big sagebrush and sagebrush larkspur (Delphinium megacarpum) may also be killed with a single application of 2, 4-D, but the timing is even more difficult. We sprayed 1, 200 acres of Squaw Butte Range in 1955 with timing chosen to obtain sagebrush control with the bonus of larkspur control. The application was 1. 4 pounds per acre of butyl 2, 4-D in water at five gallons per acre on May 19 and 20. Sagebrush mortality here was 95 percent and larkspur mortality was 75 percent as sampled one year later. There was further decrease of larkspur in 1956, making a total reduction of 90 percent two years after spraying. Considering the hazard of improper timing with respect to species susceptibility, we recommend an application of ester 2, 4-D at two pounds per acre in water at five gallons per acre in the week immediately after Sandberg bluegrass has headed out. At that time flowering stems will be apparent on some larkspur plants.

Big sagebrush often grows in association with bitterbrush on deep soils just below and in the ponderosa pine zone. Potential forage production in this type is high. The spraying problem is selective sagebrush control without damage to bitterbrush, which is a good browse forage for deer and livestock. Trials have shown both good and poor selectivity of sagebrush. The details of timing and acid rates are not complete, but it appears that early season spraying will kill the sagebrush without serious injury to bitterbrush.

Next we consider the low sagebrush type. This is Artemesia arbuscula which is generally found growing in pure stands. Low sagebrush appears to be as susceptible to 2, 4-D as is big sagebrush, but we do not expect that

its control will pay off as well. Low sagebrush grows on shallow soils which are relatively low in productive potential, and is desired as winter browse for deer and antelope. We do not recommend controlling low sagebrush unless full consideration is given to multiple use aspects.

Our objective in brush control should be permanent improvement in range condition. A more selfish and short-time objective can leave the range in poor condition. All of the background of knowledge and experience must be invoked to assure proper grazing management. Unsatisfactory examples are already available. In one case protection from grazing was believed to be assured because livestock water was three to four miles away. In spite of this distance, the cattle concentrated upon the sprayed area but avoided grazing upon the surrounding unsprayed range. No doubt the area sprayed will produce a lot of weeds and cheatgrass for several more years under such overuse, but the end product may well be a wasted range. One can only hope that the sagebrush will return quickly and provide some soil protection.

Spraying with 2,4-D is relatively new, but forage management is the same old story - it is necessary to maintain control over the season and degree of grazing use. Deferred grazing is recommended in the year of spraying and in the year following spraying. Thereafter judicious grazing is essential. With deferred grazing the grasses respond to sagebrush control. Measurements and observations have shown a tremendous increase in heading and seed production, increase in the basal size of the grasses, some increase in the numbers of grasses, and a big increase in herbage yield. (See Table 1.)

Study has shown that squirreltail, Koeleria, and bluegrasses respond most quickly and abundantly to sagebrush control. Since we desire to close the community as quickly as possible, it is important that these early-responders be present on areas chosen for spraying. Other species such as Thurber needlegrass, giant wild ryegrass, and bluebunch wheatgrass require three or four years to show important increases. Although squirreltail has been the most rapid increaser, its response has been temporary. On a field sprayed in 1952 squirreltail provided the dominant aspect one year later. Four years later it produced only six percent and bluebunch wheatgrass produced 26 percent of the herbage. To our surprise the forb population and production has also increased without showing much decrease even in the year after spraying. Prior to spraying this field produced an average annual herbage yield of 225 pounds per acre. In the five years since, spraying herbage yields have averaged 700 pounds per acre. Range condition improved from fair to near excellent in five years, during which time it has turned off on the average 2-1/2 times more beef than prior to spraying.

Although the sagebrush is returning slowly, the improvement obtained should never be completely lost.

[1] Abstract of a paper presented at the Eleventh Annual Meeting of the American Society of Range Management, January 30, 1958. Phoenix, Arizona.

[2] Range Conservationists, Crops Research Division, U. S. Department of Agriculture, Agricultural Research Service, Squaw Butte-Harney Experiment Station, Burns, Oregon; and Oregon Agricultural Experiment Station.

Table I

Herbage production comparing untreated plots with plots sprayed for the control of big sagebrush:

Year	Herbage Production in Lb/A Oven Dry		
	Sprayed in 1951	Unsprayed	Increase by Spraying
1952	528	173	355
1953	807	220	587
1954	461	177	284
Average	599	190	409

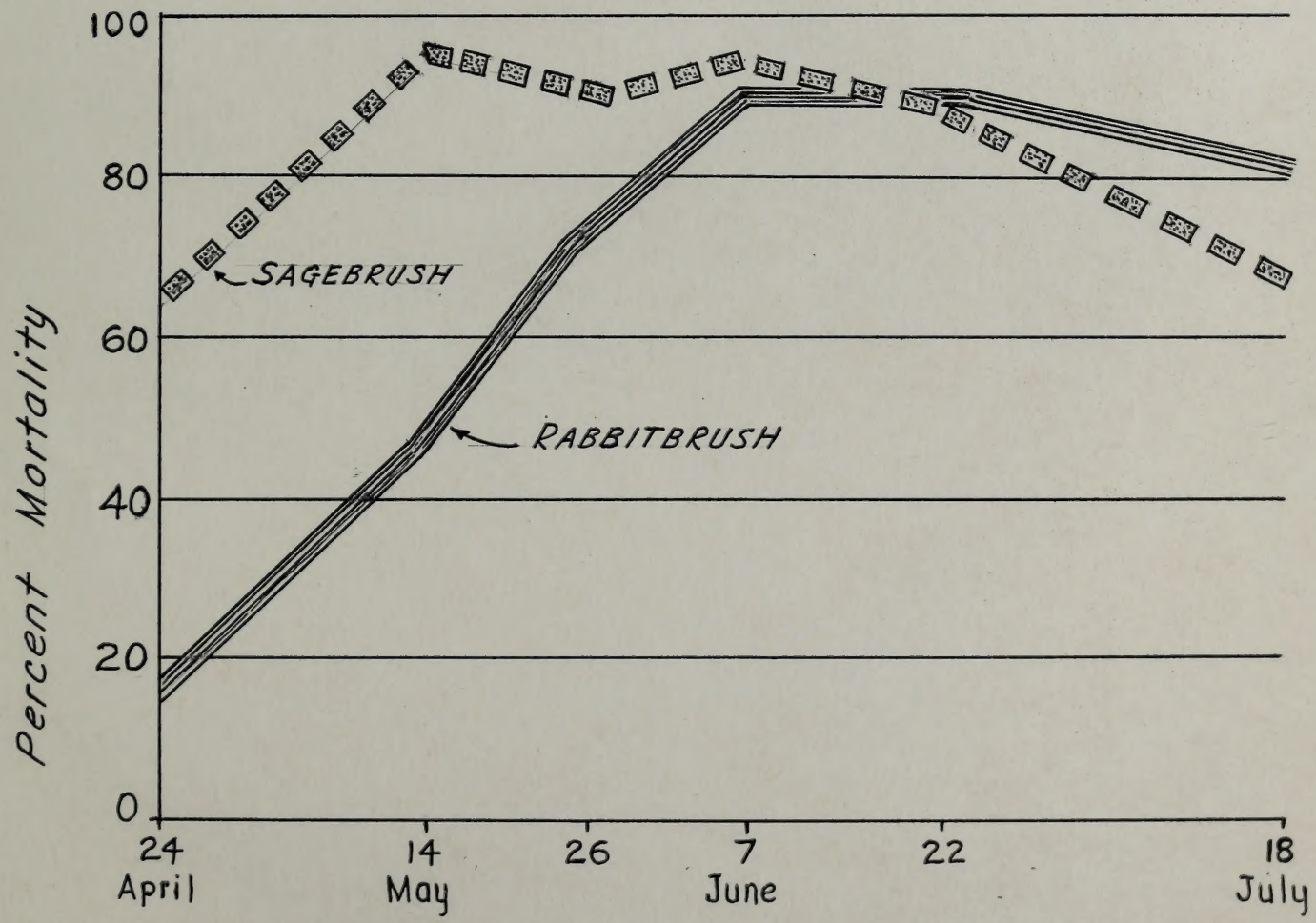
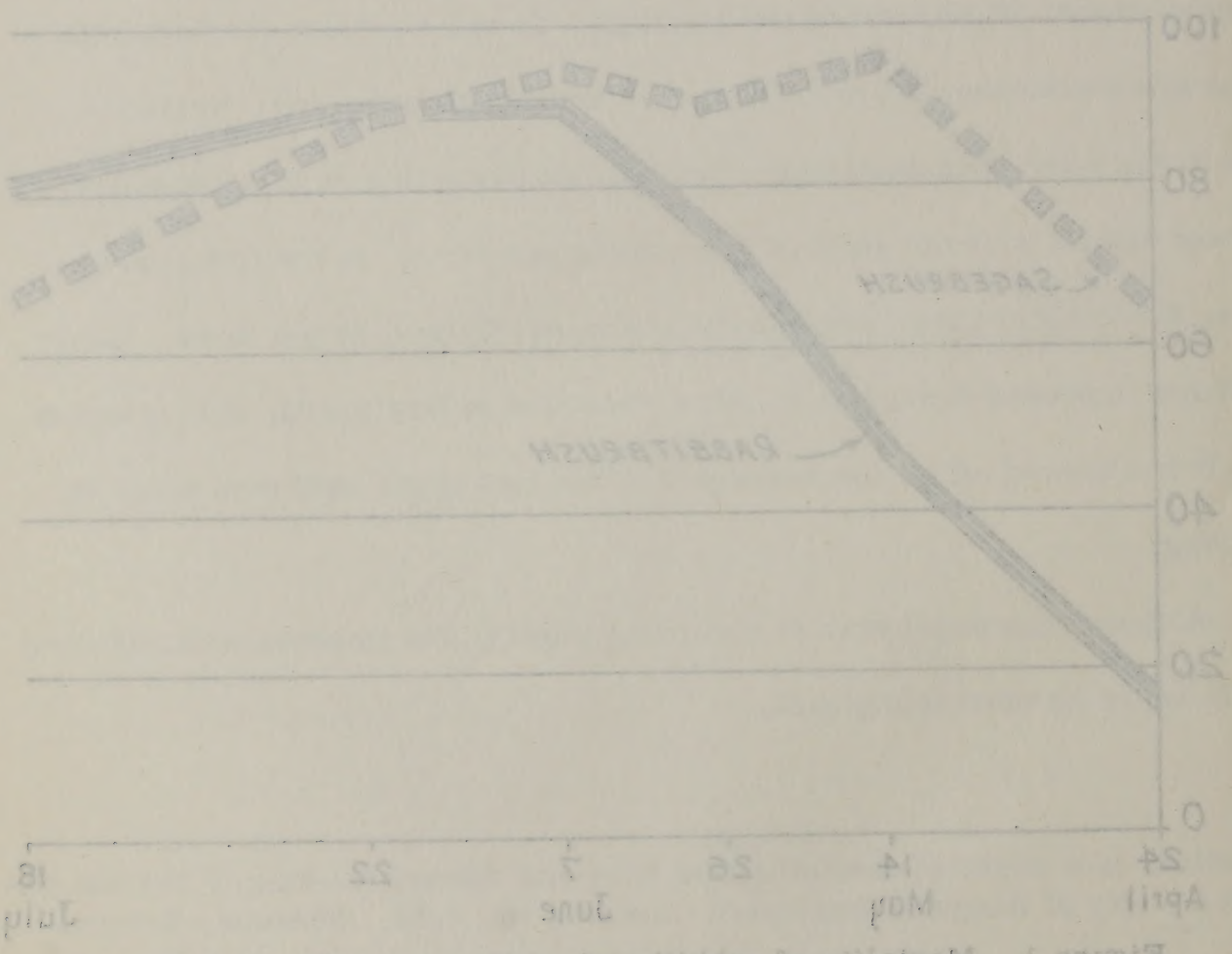


Figure 1. Mortality of rabbitbrush at three pounds per acre and sagebrush at two pounds per acre of 2, 4-D.


100
80
60
40
20
0
Percent Mortality
24
April
14
May
26
7
June
22
18
July